IOWA STATE UNIVERSITY
Department of Kinesiology

Honors Poster Presentation
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# Maneuvering over an obstacle in dim light: joint moment distribution and implications for older adults

## INTRODUCTION

- Falls are very dangerous and prevalent in older adults (OA)
- Dim lighting combined with other vision problems common to OA leads to unstable gait [1]
- OA with reduced retinal sensitivity have increased fall rate in dim lighting [2]
- Stepping over obstacles may cause older adults to place greater demand on hip extensors of stance leg

- **Hypothesis: hip extensor moments will be higher with an obstacle and hip abduction moments will be higher in the dark condition**

## METHODS

### PARTICIPANTS and EQUIPMENT:

- Ten (5 female, 5 male) healthy young adults participated (age 21.9 ± 1.3 yr, mass 75 ± 19 kg, height 1.76 m ± 0.13 m)
- Force platform measured ground reaction forces during walking/walking over obstacle in light and dark lighting
- Obstacle was a low stool measuring about a foot high
- Eight Vicon Nexus Motion Capture cameras tracked reflective markers placed on each participant's right leg and trunk

### EXPERIMENTAL PROTOCOL:

- Four conditions:
  - Walking in normal lighting
  - Stepping over obstacle in normal lighting
  - Walking in dark
  - Stepping over obstacle in dark
- Participants performed 3 trials of each condition
- Participants walked at their preferred speed

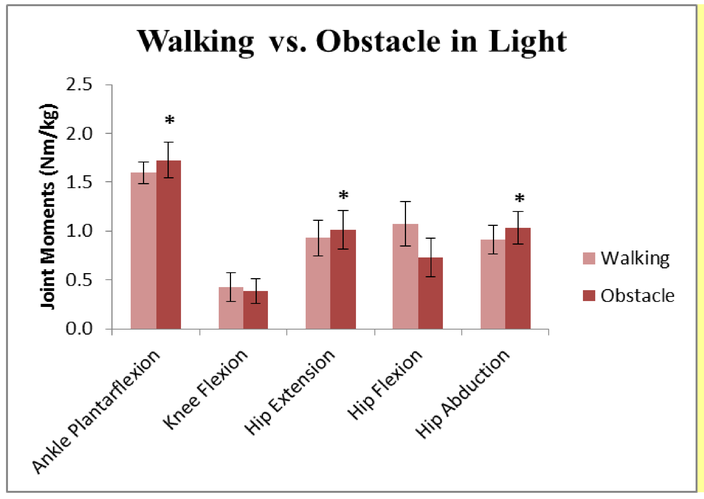


**Figure 1: Average joint moments of stance leg with standard deviations. Ankle plantarflexion, hip extension, and hip abduction moments were significantly higher for obstacle (* p < 0.05).**

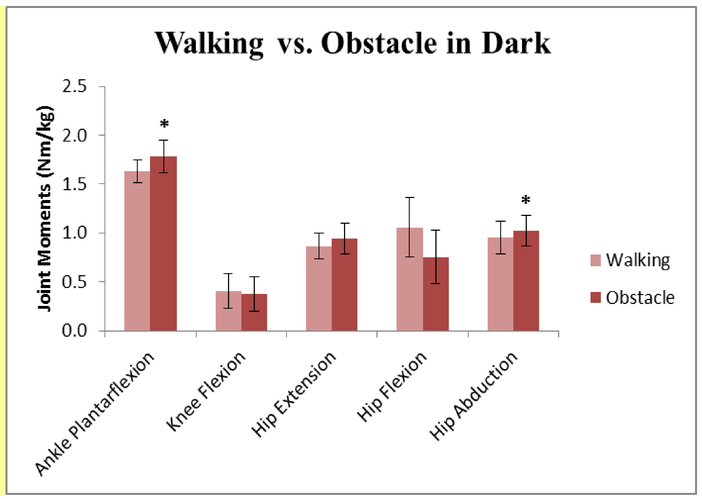


**Figure 2: Average joint moments of stance leg with standard deviations. Ankle plantarflexion and hip abduction moments were significantly higher for obstacle (* p < 0.05).**

## RESULTS

- Obstacle vs. walking (in light): Ankle plantarflexion, hip extension, and hip abduction moments were significantly higher ($p < 0.05$)
- Obstacle vs. walking (in dark): Ankle plantarflexion and hip abduction moments were significantly higher ($p < 0.05$)
- Dark vs. light (walking): Ankle plantarflexion moments were significantly higher ($p < 0.05$)

## DISCUSSION

- Increase in stance leg hip abduction moments when stepping over obstacle
  - ➢ Strengthening hip abductors may help with side-to-side balance when stepping over an obstacle
- Increase in stance leg ankle plantarflexion and hip extension moments while stepping over obstacle
  - ➢ Strengthening ankle plantarflexors and hip extensors may help with standing on one leg for longer duration when stepping over obstacle
- Increase in stance leg ankle plantarflexion moments in dim lighting
  - ➢ Ankle plantarflexors may play larger sensory role when visual information is reduced
- Further research is needed to test if OA effectively use their ankle plantarflexors when stepping over obstacles in dim lighting

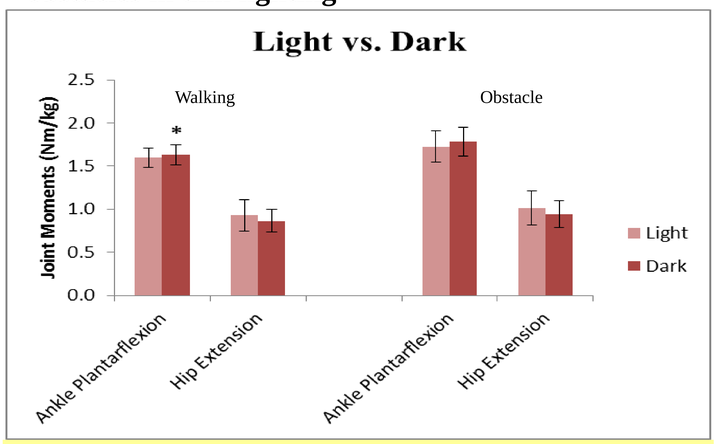


**Figure 3: Average joint moments of stance leg with standard deviations. Ankle plantarflexion moments were significantly higher during walking in the dark (* p < 0.05)**

## REFERENCES

[1] Helbostad JL, et al. (2009). *Gait & Posture,* 30.2, 233-38.

[2] Mcmurdo ME, Gaskell A (1991). *Gerontology*, 37.4, 221-24.